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NOTES ON THE PHILOSOPHY OF HENRI BERGSON

I. Anti-intellectualism and Immediatism

THE appearance almost simultaneously of English translations of Bergson's principal works[1] is significant of the author's rapid growth in fame and influence. All three translations have been revised by the author himself, and to the "Matter and Memory" he has contributed a new introduction by his own hand. Considering the peculiarly idiomatic character of the original text, the translations are admirable both in clearness and fidelity, and should make Bergson's philosophy readily accessible to the English reader.

Of the three, the "Matter and Memory" will probably receive the least attention, despite the fact that in the estimation of many of his colleagues it will remain his soundest and most rigorous contribution to technical philosophy. This book, especially in respect of its treatment of "pure perception," is comparatively realistic and naturalistic.[2] The "Time and Free Will," and "Creative Evolution," on the other hand, sound the more speculative note. They contain the assault upon "intellectualism," and the exposition of a metaphysical "dynamism," or "activism." On this side Bergson borders upon the voluntaristic and romanticist developments of German idealism. Together with Eucken, Rickert, and others, he is an advisory editor of *Logos*, the organ of the new idealistic revival. If Bergson is in this rôle less original and unique, he is not on that account less influential. He is identified with a present tendency which promises to be widely popular, and which is already in the ascendant in the thought and culture of Germany. As between the phi-

[1] "Time and Free Will," a translation of Bergson's "Essai sur les données immédiates de la conscience," by F. L. Pogson, Swan Sonnenschein & Co., 1910, pp. xxiii + 252; "Creative Evolution," a translation of "L'évolution créatrice," by Arthur Mitchell, Henry Holt & Co., 1911, pp. xv + 407; "Matter and Memory," a translation of "Matière et mémoire," by N. M. Paul and W. S. Palmer, Swan Sonnenschein & Co., 1911, pp. xx + 339.

[2] *Cf.* Ch. I., and the introduction to the translation.

losophy of immediacy and activity, which is already a gospel, and will shortly be a faith; and the philosophy of analysis, which is necessarily a critique, and to the most sanguine belief even a disillusionment, Bergson is flatly on the side of the former. In the comment which follows I shall have to do not with the psychological and biological Bergson, but with this speculative and prophetic Bergson. I shall deal in the present paper with his attack upon intellectualism, and in a second paper with his doctrine of freedom and creative activity.

Of eminent contemporary writers belonging to the pragmatist school in the broad sense, Bergson is the most radical "anti-intellectualist." In his opinion intellect not only divides and separates reality, thus replacing its concrete fulness with abstracted and partial aspects; but is doomed to failure, however far its activities may be carried. Intellect can not, in short, correct itself, and atone for its own shortcomings. The cause for this inevitable failure lies in the fact that intellect is essentially the instrument of action. For the purpose of action it is necessary to specify and fixate some present aspect of the environment. The object of action must be distinguished and held by the attention. Through the repetition of such attitudes the intellect elaborates a scheme, or diagram, in which the several terms of analysis are correlated. They remain distinct and external, but are woven by relations into a system, which is like its component terms in being stereotyped and fixed. The pattern of all such systems is geometry, the most perfect expression of the analytical method. The sign of the intellect's handiwork is spacial juxtaposition and arrangement, the static coordination of discriminated elements. In vain, then, does the intellect seek to correct itself—for the further it proceeds the more thoroughly does it reduce reality to this form.

And it is this form itself, and not any specific or incomplete phase of it, that is foreign to the native, aboriginal quality of reality. The latter abides, not in fixity, but in fluidity; not in sharpness of outline, but in adumbration; not in external juxtaposition, but in interpenetration; not in discreteness, but in continuity; not in space, but in time. The helplessness of the intellect to escape its own inveterate habits appears most strikingly in its treatment of time. For it spacializes even this, conceiving it as a linear series of instants; whereas real time is an *enduring* (*durée réelle*)—a continuous and cumulative history, a growing old. And this real time we do not *think;* we "*live* it, because life transcends intellect."[3]

Bergson's indictment of the intellectual method rests, I am convinced, on a misunderstanding of that method. In the first place,

[3] "Creative Evolution," p. 46. *Cf.* Ch. I., *passim.*

Bergson is not clear as to whether a concept is to be distinguished by its function or its content. Is "concept" the same as "idea," or is it a special class of ideas? This question is of crucial importance. For if "concept" is only another name for "idea," and if an idea is essentially a function or office, and not a content, then the failure of concepts must mean simply the failure of the ideating or mediating operation of thought. But this operation, according, at least, to the pragmatist account, is essentially a mode of access to immediacy. The more it is perfected the more unerringly it leads us into the presence of its object. To prove that intellect is essentially instrumental, and then to attack it in behalf of the very end for which it is useful, would be a strange procedure. In fact the anti-intellectualist perpetually employs intellect in this sense, even with reference to "reality." He uses words and figures of speech which he hopes will conduct the reader or hearer to the immediate experience in which it is revealed. The anti-intellectualist would have no ground for maintaining that there is any reality which can not be represented, for he means by representation only a pointing or guiding, for which anything may serve. And whatever is experienced or felt can be represented in this sense, because it is necessary only that it should have a locus or context to which one may be directed.

We must suppose, then, that what the anti-intellectualist attacks is not the idea as such, but a certain class of ideas, such as the logical or mathematical ideas, "term" and "line." But it should be observed that for pragmatism the content of an idea is accidental. "Term" and "line" are ideas only when *used* in a certain way. In themselves they are simply characteristic bits of experience. They may be immediately known or presented, as well as used in discursive thought. Even "abstractions" may be apprehended by a direct act of discrimination, and it is only in such direct apprehension that their specific character is revealed. It can not be claimed that such bits of experience as "term" and "line" are peculiarly ill fitted to serve as ideas, because, as we have seen, the content of an idea is irrelevant. *Any* bit of experience will do, as is best illustrated by the case of words. In short the fault, if there be any, can not lie in the intellectual use of these elements; it must lie in their inherent character. The anti-intellectualist polemic must mean that reality is not such as "term" and "line"; or that these characters are somehow contradicted and overruled by the dominant characters of reality, such as continuity and life. But this contention rests, I think, on a second misunderstanding.

There is an inveterate liability to confuse a symbolized relation

with a relation of symbols. It is commonly supposed that when a complex is represented by a formula, the elements of the complex must have the same relation as that which subsists between the parts of the formula; whereas, as a matter of fact, *the formula as a whole* represents or describes a complex other than itself. If I describe *a* as "to the right of" *b*, does any difficulty arise because in my formula *a* is to the left of *b*? If I speak of *a* as greater than *b*, am I to assume that because my symbols are outside one another *a* and *b* must be outside one another? Such a supposition would imply a most naïve acceptance of that very "copy theory" of knowledge which pragmatism has so severely condemned. And yet such a supposition seems everywhere to underlie the anti-intellectualist's polemic. The intellect is described as "substituting for the interpenetration of the real terms the juxtaposition of their symbols";[4] as though analysis discovered terms, and then *conferred* relations of its own. Whereas, as James, for example, has been at much pains to point out,[5] terms and relations have the same status. Terms are found *in* relation, and may be thus described without any more artificiality, without any more imposing of the forms of the mind on its subject-matter, than is involved in the bare mention of a single term.

It is this misunderstanding which underlies the anti-intellectualist's contention that continuity can not be described. "For," says James in his exposition of Bergson, "you can not make continuous being out of discontinuities, and your concepts are discontinuous. The stages into which you analyze a change are *states*, the change itself goes on between them. It lies along their intervals, inhabits what your definition fails to gather up, and thus eludes conceptual explanation altogether."[6] I can understand this argument only provided the author assumes that the intellectualist tries to reproduce continuity by *adding concept to concept*. The successive and discontinuous *terms of the representation* are then held to be contrary to the continuity of the subject-matter. But the assumption is incorrect. A line, for example, may be conceived as a class of positions possessing interrelations of direction and distance. This conception may be represented by the formula, *a . . . c . . . d . . . n. . . .* One may then add the statement that between any two positions such as *a* and *c*, there is a third position, *b*, which is after *a* and before *c*; thus expressly denying that there is the same hiatus between the positions of the line as appears between the symbols of the representation. The use of the symbols *a*, *c*, etc., indicates the manifoldness and serial

[4] "Time and Free Will," p. 134.
[5] *Cf., e. g.*, "A Pluralistic Universe," Appendix A.
[6] *Ibid.*, p. 236.

order of the positions, and the statement defines their "compactness." With such a formula and such a statement one may *mean* continuity, despite the fact that the symbols and words are discrete. The word "blue" may mean blue, although the word itself is not blue. Similarly, continuity may be an arrangement meant by a discontinuous arrangement of symbols and words.

In the third place, the anti-intellectualist polemic is based upon the misconception that whenever concepts are used they must be used "privatively," in James's sense. In other words, it is taken for granted that all intellectualism must be "vicious," or blind to its own abstractness. James distinguishes this view as one variety of intellectualism. To conceive a thing as *a*, and then assume that it is *only a*, is to be "viciously" intellectual. But it is only fair to infer that, provided one recognizes that to be *a* does not prevent a thing's being also *b*, *c*, etc., one may be innocently or even beneficently intellectual. And this possibility Bergson, at any rate, appears to overlook. Thus he constantly argues as though the use of the relational logic involved the reduction of everything to it. The analytical method does imply that reality consists of terms and relations. It does *not*, however, imply that the bare term-and-relation-character is all there is to it. Thus blue is different from red, which is a case of $t'(R)t^2$. But in the concrete case the bare logical term-character, *t*, is united first with one quality, and then with another, while *R* is not merely relation in general, but the specific relation of "difference." And similarly the formulas of mathematics, mechanics, physics, etc., while they are cases of logical systems, have each their special superadded and distinguishing characters.

Thus the abstract logical system is non-temporal; but a temporal system may nevertheless be *a case* of a logical system, provided the time character be introduced. Hence it is absurd to say, as Bergson says, that "when the mathematician calculates the future state of a system at the end of a time *t*, there is nothing to prevent him from supposing that the universe vanishes from this moment till that, and suddenly reappears. It is the *t*-th moment only that counts—and that will be a mere instant. What will flow on in the interval—that is to say, real time—does not count, and can not enter into the calculation."[7] I can make nothing of this, unless the author is regarding *t* merely as a *number*. But as a matter of fact *t* is a number of units of *time*, hence an interval, an extended flow; and multiplying this factor into the formula means that the whole process has continued *through* that interval—it means that the lapse of time *is* counted, is expressly brought into the calculation.

[7] "Creative Evolution," p. 22.

Or, consider the same author's contention that to conceive time is to spacialize it. Again he is misled by supposing that because time is conceived as orderly, it is therefore *nothing but* order. Such an intellectualism would indeed be vicious. Bare logical order *is* static, and can never of itself express time. But it is an utterly different matter to regard time, like space and number, as *a case* of order, having the specific time *quale* over and above the properties of order. "Position," "interval," "before" and "after," are then to be taken in the temporal sense; and the terms of the series are to be taken, not as bare logical terms, still less as spacial points, but as instants possessing a unique time-character of their own.

Radical anti-intellectualism betrays, in short, a misapprehension of the analytical method. This method means simply the discrimination and specification of the detail of experience. It has led to the discovery and systematic description of certain elements and relationships that possess a remarkably high degree of generality, such, *e. g.*, as those of logic and mathematic. But while these elements and relationships, because of their generality, serve to make things commensurable on a comprehensive scale, and are consequently of a peculiar importance in knowledge, it does not follow that intellectualism aims to abolish everything else. That which *has* form is not *pure* form. Furthermore, it is entirely incorrect to suppose that intellectualism imposes the relational and orderly arrangement regardless of the subject-matter. The analytical method is not an accident or prejudice. It arises from the fact that the subject-matter with which science and philosophy deal is *complex*. And this is virtually admitted in every reference to it which anti-intellectualistic writers make. Continuity, duration, activity and life, present, even in the most immediate experience of them which it is possible to obtain, an unmistakable multiplicity of character. They may be divided, and their several characters abstracted and named in turn, because they *contain variety*. The anti-intellectualist is apparently ready to admit their multiplicity, but balks at admitting their "distinct multiplicity."[8] But "distinctness" and "indistinctness" are psychological and not ontological differences. An "indistinct multiplicity" is simply a multiplicity that is as yet but imperfectly known, a distinct multiplicity in things, qualified by an incompleteness of discrimination.

But anti-intellectualism is involved in a more serious error. It not only misunderstands the view which it attacks; but it puts forth a claim of its own which is unfounded—the claim, namely, to the immediate apprehension of a fused and inarticulate unity. It

[8] *Ibid.*, Introduction, p. xiv.

exploits what may conveniently be named the error of "pseudo-simplicity."[9]

This error consists in projecting a verbal or subjective simplicity into the object. The single *word* "life," *e. g.*, is used to refer to the complex *thing,* life. It is then assumed that behind the various characters of life, or infusing them, there must be a corresponding unity. Or, at the outset of inquiry life is a problematic unity, a bare *that,* a something-to-be-known; and it is assumed that this simple *quale,* this merging of elements not-yet-but-to-be-distinguished, must somehow be among the elements themselves. Now there are two ways of unifying experience. One way is to *carry analysis through,* and discover the connections of the parts and the articulate structure of the whole. The other is to reverse the operation, to *carry it back* to its vanishing point—to the bare word or the bare feeling of attention. In the second case the experience is simplified—by the disappearance of the object! A perfect simplicity, an ineffable unity, is attained at the point where the object drops out altogether. But then knowledge has ceased; and the experience, what there is of it, is of no cognitive significance whatsoever. Thus Bergson says: "The more we succeed in making ourselves conscious of our progress in pure duration, the more we feel the different parts of our being enter into each other, and our whole personality concentrate itself in a point."[10] What Bergson is here describing is, I am convinced, the disappearance of cognition into an experience which is not an experience *of* anything at all. Such a unification may be obtained by falling asleep, as by auto-hypnosis. It throws no light whatever on the nature of anything. My experience *of* life has dissolved; but nothing follows concerning the nature of life. I have simply closed my eyes to it. I have blurred and blotted out my knowledge of life; but life is not therefore blurred or extinct. In the twilight all things are gray; in ignorance all things are simple. Bergson speaks of the "feeling of duration" as "the actual coinciding of ourself with itself";[11] and this, he says, admits of degrees. But I am not more alive when I feel duration than I was before when I thought it. The difference is that whereas I formerly knew duration, or something of it, now I know comparatively nothing; I simply *am* duration. Duration itself is neither more nor less complex than it was before; my knowledge only has been simplified—to the point of disappearance. Bergson speaks of an instinctive sympathy, which if it "could extend its object and also reflect upon itself," "would give us the key to

[9] *Cf.* my article "Realism as a Polemic and Program of Reform," this JOURNAL, Vol. VII., No. 13.

[10] "Creative Evolution," p. 201.

[11] *Ibid.*, p. 200.

vital operations.''[12] But I believe that it is safe to say that in proportion as there is reflection upon instinct, its complexity is manifest, and that in proportion as instinct is simple, it has escaped experience altogether, and is, so far as cognition is concerned, nothing.

The critique of intellectualism tends to assume one or the other of two forms. Using Dewey's term ''immediatism'' to express this doctrine positively rather than negatively, we may say that there is a subjectivistic or idealistic version of immediatism and a realistic version of immediatism. The crucial issue upon which the idealistic and realistic versions of immediatism divide is whether the activity of the intellect is creative or selective. Does the intellect *generate* concepts, or does it *discover* them?

If we are to judge from the ''Creative Evolution,'' Bergson regards the intellect as an artificer. In other words, ideas, things, objects, are essentially ''the modalities of creative action.''[13] In the end they express not the environment but the agent. It is by no means clear that this is consistent with Bergson's view, that intellect is a means of adaptation. ''If,'' as he himself says, ''the intellectual form of the living being has been gradually modeled on the reciprocal actions and reactions of certain bodies and their material environment, how should it not reveal to us something of the very essence of which these bodies are made?''[14] But this query does not prevent Bergson from deriving ''intellectual form'' from the intellect itself. The origin of it is to be looked for ''in the structure of our intellect, which is formed to act on matter from without, and which succeeds by making, in the flux of the real, instantaneous cuts, each of which becomes, in its fixity, endlessly decomposable. . . . *This complexity is the work of the understanding.*''[15] In other words, the *relational texture*, the *grain* of things, is generated by intellect. Given matter, not yet intellectualized, is pure flux, in its own substance as simple, smooth, and undivided as the life which acts on it—the life of which it is but the ''inverse'' movement.[16] According to this view, then, to conceive is to bring into being that which is called concept. Conceptual definiteness is the derivative of the pure activity of intellect, and is in no sense contained in that upon which intellect operates.

According to the realistic version of immediatism, on the other hand, the intellect discovers, but does not make, concepts. This is

[12] *Ibid.*, p. 176.

[13] *Ibid.*, p. 249.

[14] *Ibid.*, Introduction, p. xi.

[15] *Ibid.*, p. 250 (italics mine).

[16] While the work of intellect is not absolutely creative, in that there is something on which it works, the latter would appear to be only a potentiality or negation.

the view that is on the whole consistently maintained by James. Concepts are not merely functions of the intellect, they constitute a "coordinate realm" of reality. "If we take the world of geometrical relations, the thousandth decimal of π sleeps there, though no one may ever try to compute it."[17] "Philosophy must thus recognize many realms of reality which mutually interpenetrate. The conceptual systems of mathematics, logic, ethics, are such realms, each strung upon some peculiar form of relation, and each differing from perceptual reality in that in no one of them is history or happening displayed. *Perceptual reality involves and contains all these ideal systems and vastly more besides.*"[18] The crux of the matter lies in this last statement. Reality is not *other* than the conceptual order, but *more* than the conceptual order. Intellect is an organ, not of fabrication, but of "discernment"; a power men have "to single out the most fugitive elements of what passes before them . . . aspect within aspect, quality after quality, relation upon relation."[19]

When thus construed, the pragmatist account of intellect is consistent with naturalistic grounds of pragmatism. Concepts work because the environment is presented and displayed in them. Since nature has logical and mathematical properties, it is expedient to act as though it had; while an intellect that was fatally predestined to falsify the environment would be as misleading to action as it would be inherently arbitrary and meaningless. And this realistic construction of concepts is entirely consistent with a censure of their blind and uncritical use. Because nature is logical and mathematical, it does not follow that it is *merely* logical and mathematical. Such an intellectualism is vicious indeed. The abstracting of *some* characters of reality is beset by a characteristic error, the error of ignoring the rest. This follows from the fact that intellect is *selective;* it in no way implies that intellect is creative. It is also true that in a sense the perceptual world is richer than the conceptual, since the latter is abstracted *from* it, leaving a residuum behind. James, it is true, goes further than this and contends, with Bergson, that there are some properties of reality, the "dynamic" or "temporal" properties, which can not be conceived.[20] But this is due, I think, to a misunderstanding. If to conceive is not to alter, but only to *distinguish,* then conceiving is not contrary to any property; to mention a property with a view to showing its inconceivability is to conceive it. And all properties stand on the same footing with

[17] James, "Meaning of Truth," pp. 42 (note), 203.

[18] "Some Problems of Philosophy," pp. 101–102 (italics mine). *Cf.* also *op. cit.,* p. 56; "Pluralistic Universe," pp. 339–340 (note).

[19] *Ibid.,* pp. 51, 52.

[20] *Ibid.,* pp. 81, 101.

reference to the function of mediation. All may be known mediately; but to know them mediately is only an indirect way of knowing them immediately. This is as true of a mathematical triangle, which is mediately known by means of these words, as of color, life, or anything else. When corrected in the light of these considerations, the realistic anti-intellectualism of James escapes the verbalism and abstractionism of "vicious intellectualism," without that discrediting of analysis and lapse into uncritical intuition—that dissolution of order into chaos, which marks an even more vicious immediatism.

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PHILOSOPHY AND THE FLATFISH

THERE has recently appeared a monograph[1] by Francis B. Sumner, of the United States Fisheries Laboratory at Woods Hole, Massachusetts, which contains a number of facts important to all philosophers who are endeavoring to construct a new world-view. There are two reasons why these facts should be here reported and discussed: first, zoologists, under whose eyes alone the monograph is likely to fall, are unfortunately not interested in the philosophical implications of their *own* researches; and, secondly, philosophers mostly refrain from analyzing such *very* empirical matters as, say, the behavior of the flatfish, and distrust every other philosopher who dares wander so far from his own bailiwick, which is supposed to include little more than "pure logic" and "pure experiences." The consequence of this mutual aloofness is that most philosophers are very wretched biologists and most biologists no less wretched philosophers. When, therefore, a fact is brought to light which is absolutely unequivocal and empirically demonstrated and laden with implications about the nature of organic adjustments, percepts, and the perceiving process, it should be proclaimed.

Such a fact is found in Sumner's study. It interests me peculiarly because it completely confirms, by experimentation, the central point of my conclusions about the retinal image and the imitative reflex.[2] My own inferences were reached by an analysis of a few somewhat obscure psychological events. In order to follow the analysis, the reader had to observe those events with severe accuracy;

[1] "The Adjustment of Flatfishes to Various Backgrounds," *Journal of Experimental Zoology*, Vol. X., No. 4.

[2] This JOURNAL, Vol. VII., pp. 92 and 204. The second of these papers was read, in part, before the American Philosophical Association, December, 1909.

but this seems to have been not at all easy, if I may judge from what few comments were passed on them. In Sumner's data, though, no such difficulty arises. Anybody can grasp them readily, and some of their implications force themselves upon whomsoever is at all familiar with the problems centering around perception. I need hardly say that these implications have not been drawn by Sumner.

The flatfish, like many other varieties, changes its hue to conform to the color of the backgrounds on which the creature happens to lie. For a time biologists supposed that this adaptation was effected by some direct photochemism—*i. e.*, by action of light upon the skin. But, a quarter century ago, Pouchet proved that it was brought about through the functioning of the eye. He found that blinded fish do not change their color adaptively. Interesting and significant as this discovery is, however, it does not tell us anything about the most astounding behavior of the flatfish, namely, its adaptation of its own geometrical skin-patterns to copy the geometrical pattern of the sea-bottom upon which it rests. By one of those freaks of circumstance which are only too common in all scientific fields, nobody paid serious attention to this phenomenon until Sumner approached it last year, first at the Naples aquarium and later at Woods Hole. "In observing a turbot," says Sumner, "I was impressed by the detailed resemblance which obtained between the markings of the skin and the appearance of the gravel on which the fish rested. . . . The query at once suggested itself: Is it a mere coincidence, or does the fish have the power of controlling the color *pattern* as well as the general color *tone* of the body?"

To answer this, Sumner prepared a number of backgrounds, some reproducing various types of natural sea-bottom (fine sand, coarse sand, fine gravel, coarse gravel, of various colors), and some being highly unnatural geometrical patterns (checkerboard, polka dot, stripes, screen, etc.). Placed in a tank having one of these patterns on its bottom, the flatfish began to copy the pattern *on its back.* ("Copying" does not imply "consciousness" or "effort," so far as the mere use of the word here is concerned.) The time required to complete the imitation varied.

> This time ranged from a few seconds to several days. A change involving the almost complete withdrawal from view of the skin pigments in a dark specimen probably required the longest period. In general, . . . the maximum effect was commonly attained within one or two days at the most. The fact . . . that practise or habituation to these changes greatly reduces the time required was clearly shown. . . . Certain specimens, after several changes of background, were found to adapt themselves, in almost full measure, to one of these within a fraction of a minute.

The reader can not be asked to believe that some of the adaptations were so perfect that, in photographs, the flatfish is all but indistinguishable from the background; or that the spots on the skin became smaller when the diameter of spots on the background was reduced by less than a centimeter. To appreciate this, he must inspect the photographs appended to the monograph. Naturally, the imitation was by no means equally successful against all backgrounds. "Fixed morphological conditions" prevented the reproduction of perfect squares, triangles, circles, etc. It was, however, so exceedingly plastic and sensitive that "the notion that the fish is limited to a few stereotyped responses, representing the most familiar types of habitat, must be rejected at once."

The discoveries of greatest interest to the psychologist and the philosopher are still to be told. They are two: *first, the imitation is accomplished through the flatfish's eyes; and, secondly, only a part of the fish's visual field is involved in the process—the creature does not imitate everything it sees.* The first discovery might have been made by pure analysis. For, were the eye not the instrument of imitation, then we should have to assume that the light reflected up from the background acted directly on the skin. Against this, however, there are two objections: first, the flatfish's belly, which directly receives the reflected light, is *not* sensitive—*only the back, turned away from the reflected light,* takes on the patterns; and, secondly, as Sumner points out, "it is impossible to see how responses to a *pattern* could be brought about through any organs except the eyes, for these alone are provided with the lenses necessary for the production of images." The reader who suspects the analytical method, however, may ignore these proofs.[3] For Sumner has demonstrated the matter by cauterizing the flatfish's eyes with silver nitrate, blindfolding them, or blinding them completely. So treated, the animal ceased altogether to imitate the background pattern, and its hue reverted to an even, dark shade "representing more nearly the resting state of the chromatophores."

The second discovery grew out of a series of experiments in which the walls of the tank were variously colored and patterned.

> In the case of the *Rhomboidichthys,* . . . that part of the bottom immediately surrounding the fish appeared to be the one chiefly effective. . . . The influence of the vertical walls of the vessel commonly seemed to be a subordinate one, *even in cases where the fish was so large that it covered a considerable frac-*

[3] The possibility that tactile stimuli may produce the effect can not be absolutely eliminated by pure analysis. Sumner has put it out of court, though, by the simple experiment of putting fish on glass bottoms, the under side of which was painted with patterns. The imitative reaction was *exactly as quick and as sure as ever.*

tion of the bottom and was obliged to lie constantly with its eyes close to one side or another of the jar. . . . What the fish saw directly overhead . . . seemed to exert a negligible influence upon the color pattern.

So much for the chief facts. Let us now consider their bearings upon the problem of space perception. Be it noted, first of all, that the imitative reaction is not seen by the flatfish—or at least only partially—and that Sumner has shown that the animal can adapt while its entire body (except for the eyes) is buried in sand or completely masked with a cloth or deeply stained. This renders it "highly improbable that any direct visual comparison on the part of the fish between its own body surface and the surrounding background is an essential factor in the production of these changes" (p. 470). In other words, *"consciousness" (in whatever sense the term be used) is not an instrument in making one space pattern match another.* If it is not, how can anybody continue to hold the old psychological doctrine that the arrangement of space-elements (or non-spatial-elements) into forms, patterns, or perspective orders is brought about in any degree by the cognitive process, or by the "association of ideas"? As with the imitative reflex among human beings, so here. The process is set up by a physical stimulus, and its result either can not or need not be perceived by the organism. *The correspondence, therefore, is not between the flatfish's percept A and the same flatfish's percept B;* it is between a stimulus (which may or may not be perceived, for aught we yet know) and a chemical pattern *which is the cause of a perception in an external observer.* In other words, the flatfish is not imitating merely its own percept *A*, but is doing so in such a manner that *some other creature will perceive the flatfish's skin as having, not merely the characteristics of the fish's percept A, but as having the characteristics of the external cause of perceiving A.* To make this last point clear, I must call attention to a highly significant fact which biologists have overlooked.

The flatfish's eyes are very close to the sea-bottom, sometimes only a centimeter or so above it—as when it buries its body. It is while in this position that the eyes sense the shape, size, color, and arrangement of the sand and pebbles. These objects are therefore cast upon the retina in an extremely oblique perspective. You may get the general effect by holding your eye close to your desk and glancing across the latter. The foreshortening will be at a maximum; a few items in the foreground will loom up, while the converging of the rest of the field will be rapid. But this is not the scene which the flatfish reproduces on its skin. It depicts, with its chromatophores, the color, shape, size, and pattern of the material on the sea-bottom *as this material would appear to an eye whose line of direct vision*

was perpendicular to the plane of the sea-bottom and at a great enough distance from the sea-bottom so that the units of the pattern could be seen without any appreciable perspective distortion. Roughly speaking, the skin pattern closely resembles that of the sea-bottom as the latter would appear to you if you were looking directly down at it, and six inches or more away from it.

However this queer deed is accomplished, it certainly *results* in a translation of one perspective into another perspective; and *this translation is precisely that which is deducible from Euclidean space.* The rate of reduction of relative sizes in the first perspective is a function (mathematical) of the distance between eye and plane; and this very same relation governs the chemisms in the chromatophores and also the rearranging of the latter.[4] Inasmuch as this translation is accomplished without the fish's seeing what it is doing to its own skin, we must at least conclude that somehow the perspective relations are so thoroughly "in" the space which the fish sees around it that they can *cause* other perspective relations just as truly as one chemical relation causes another. And just as one chemical relation causes another, without the assistance of any psychical act, so too with perspective relations: they are not set up by the "association of ideas," nor by an "*a priori* synthesis." They are physical, no less than weight is, and absolutely non-mental in the sense that they are not *constituted* by any psychical process.

The full interpretation of this particular matter can not here be given, for I must dwell upon the other significant discovery, namely, that the flatfish adapts its skin pattern only to the sea-bottom, in normal life, and only to a somewhat larger fraction of its own visual field, under the abnormal test conditions of Sumner's laboratory tanks. The animal notices objects above the bottom and even directly overhead; it follows such with its eyes and moves toward or away from them. *But the very same pattern which sets up the pigment reactions when it is underneath the fish has absolutely no effect when above it.*

> A plate of opaque white glass, of the same size as the bottom of the tank, was covered with small, irregular blotches of black paint. . . . The three specimens used in this experiment had all been unmistakably influenced by this spotted plate when this was placed *beneath* them, assuming a much blotched appearance.

[4] Sumner has found that the plane in which a given surface lies with relation to the flatfish sometimes determines whether or not it shall be effective in calling forth a given change. It is not certain, he adds, that this influence is decided by "purely quantitative relations within the visual field." Should later experiments fully confirm the non-quantitative character of it, I think we should have to admit what I advanced in one of my previous papers on "Paradoxes of Visual Space"; namely, that *directions* are precisely as objective as extensity is.

. . . Upon the removal of the plate from beneath them, they had returned to a nearly unspotted condition. The spotted plate . . . was next inserted above the fishes (under the surface of the water, of course). The plate . . . was brightly lighted by the mirror below. That the fishes could see this spotted surface can not be doubted. Nevertheless, *not one of the specimens showed any appreciable influence, even after several days.*[1] Return of the spotted plate to the bottom of the tank, beneath the fishes, resulted in each case in a resumption of the blotched condition within a few hours at most.

Is there any other inference than that the perceiving function is not constructive or transformative, but merely selective? Certain *important* elements in the environment are attended to, to the exclusion of others, when and only when it is a question of adopting the skin pattern. The other elements are seen, but they are ignored for this particular reaction. Unquestionably, the flatfish has a genuine "field of attention" wholly distinct from the visual field. But the items entering into the field of attention are *not* transformed therewith; for they all pass over unchanged into the skin of the fish. I see no escape from the conclusion that the primary function of the psychic is to select, reject, and direct certain environmental characters with reference to certain *other* functions (such as nutrition, protection, locomotion, etc.). It seems equally sure that selection and reaction to the selected character does not necessarily alter the latter. In other words, adaptation of agent to environment does not have to involve a qualitative change in more than one of the two *relata.* And, in the special case of selective attention, this operation does not modify the essential characters of the stimuli selected for response.

In closing, I should like to suggest that the remarkable facts Sumner has brought to light may not raise the difficulties which their discoverer fears. I do not find it difficult "to conceive of a nervous mechanism competent to bring about such changes." Is it not quite probable that we have to do here with *an exceedingly simple,* rather than a mysteriously complex, structure and function? Instead of being an elaborate photochemical process which begins in the retina and undergoes a large number of incomprehensible transformations on the tract to the pigment cells, may the patterning not be effected by the direct conduction of untransformed ether waves to the chromatophores? To-day this hypothesis is not so extravagant as it was before Sherrington and others demonstrated experimentally that the periodicity of nervous impulses corresponds to the periodicity of serially repeated stimuli, at least up to rates of 500 per second. If we suppose that this correspondence holds for *all* cases, even those of ether wave shocks, we then have a nerve impulse

[1] Italics mine.

at the pigment cells which is, in pattern (if not in kind), identical with the stimulus pattern.

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VICARIOUS FUNCTIONING OF IRRELEVANT IMAGERY

OBSERVERS have frequently reported the inability to detect imagery of any kind whatever in the feeling of relation or in the consciousness of intention or purpose. On the basis of these introspections Woodworth[1] has suggested the possibility of special non-sensory centers in the association areas, which underlie the feeling of relation. Whether this cortical basis be conceived as the activity of a special organ or as a more or less definite neural set, the consciousness which goes with it is described as a "naked thought," an imageless consciousness. Such a description has been accepted by several other observers.

It is possible that the failure to detect sensory elements in these moments is due to the fact that the observer is looking for *relevant* material, usually of an imagery sort, which would, if discovered, relate more or less directly to the end processes between which the relation is objectively or socially felt to exist. Irrelevant imagery easily escapes report, as do present perseverative or sensory impressions which might easily enough be carrying the thought forward.

The writer's own introspection, in attempts to test the matter, has usually resulted in the observation of thoughts which seem to stand midway between the conventionally costumed idea and the nude relational processes which flowed through the consciousness of Woodworth's observers—thoughts, that is, which possess no decent apparel of their own, but which nevertheless make effective headway in foreign garments appropriated or borrowed to suit the occasion. Images and perseverative impressions, even immediate sensory processes from quite irrelevant sources, may often be seen to function vicariously as the end processes of a relation which is focal.

The writer's observations cover three clear degrees or stages of this vicarious activity. The first includes dream states in which images quite irrelevant as to source or quality may be seen to play a symbolic or metaphorical rôle in the play of meanings, relations, and complications of situation which make up the plot of the dream.

[1] "The Consciousness of Relation," in "Essays in Honor of William James," 1908, p. 491; and "The Cause of a Voluntary Movement," in the "Garmen Memorial Volume," 1906, p. 351.

The third stage is shown in the common observations that the vehicle of a waking meaning, the two poles of a relation, may be fragmentary, transitory, and only remotely relevant, relevant only by virtue of accidental association. The second stage is an intermediate one disclosed by observations of drowsiness hallucinations—a stage in which the thought process is a sensible and adequate waking affair, although the sensory content of consciousness may be evident dream material or even actual sensory impression of a quite foreign character. Illustrations of each of these will be given in turn, followed by a tentative suggestion as to their meaning.

1. A typical example of the first stage may be found in *Blackwood's* December number. The author of the article entitled "My Subliminal Self" describes drowsy and dream experiences illustrating clearly the process which the present writer has elsewhere called "substitution."[2] Take this description of a dream in which playing-cards were the principal actors:

> Sometimes I am identified with a certain card or suit. I am not exactly the card but am next door to it. . . . Either the cards are there and mean something else, or else they are not there and I am thinking of people in terms of cards, with the same values and precedence. Or the cards may mean two things at the same time. Then I dream in metaphor, so to speak. And I am half conscious all the while of the confusion of ideas—issues which correspond with the fall of the cards.
>
> . . . When I have held good cards or when they have fallen well for me, I do not as a rule dream much. But when I have held yarboroughs and been doubled and roughed all the evening, and foiled in every finesse, I live through new defeats in my sleep. And every turn of the game registers similarly graduated misfortune in some corresponding venture. . . . Here is an instance. I was waked up suddenly one morning and wrote down what I could remember of a bizarre encounter which I had witnessed. The thing seemed to have been going on all night. This time I was detached at first and watched the fortunes of two long sequences in Clubs and Diamonds of five or six cards to the ten and knave in each. Sometimes they were merely unpromising cards, about which I had a vague idea that they would assert themselves by some latent virtue or unforeseen chance. Then I thought of them as people belonging to a middle-class family without much backing but destined somehow to emerge. . . . Sometimes they were cards, sometimes people. I must have been on the borderland of waking, and as the supraliminal consciousness took over charge they were cards, but as I sank back into the subliminal they were people. In one phase of the dream I saw them in an office . . . and they were directing the affairs of the nation. . . . I remember seeing one card or personified card value which stood between Ten and Office jump on a train and stand on the footboard as it was leaving a station, and I saw him swept off by the girders of an iron bridge. . . . In these dreams a card retains its personality from the time it starts individual life until the spectator is lifted up on a supraliminal wave to the literal facts of the game. . . .

[2] "The Psychology of Drowsiness," *American Journal of Psychology*, January, 1911, Vol. XXII., pp. 99–111.

With me such substitution dreams are frequent. The essential point in this stage is that thought processes, interplay of relations, comparisons, and intentions may go on in terms of sensory contents which could never sustain the same relations in waking experience. Relational activity is uncontrolled and the sensory content is irrelevant—hence the conclusion is likely to be absurd.

The third stage, in which a more or less trivial and accidentally associated image or fragment acts as the vehicle of a dignified and important meaning, is a common experience. Thus in Professor Titchener's consciousness the "feeling of 'but' " is represented by "a flashing picture of a bald crown, with a fringe of hair below, and a massive black shoulder, the whole passing swiftly down the visual field from northwest to southeast." Students habitually report that the only sensory component of their idea of "justice," the meaning of which is purely relational in character, is the image of some fragment of statuary, drapery, balance, carpenter's square, etc. The essential thing about this stage is that while the thought is sane and adequate, its clothing need not be a piece of photographic imagery. It may possess no intrinsic relevance whatever and yet suffice to carry thought forward, to bear up the relation, to possess meaning, and so on. And this sort of thinking, in which relations are controlled by preliminary purpose or set, and in which the imagery need be relevant only in an extrinsic way, results in safe conclusions.

The second or intermediate stage is a curious one in which, although the relations are controlled or determined by some waking set or task or intention, the sensory contents which introspectively sustain these relations may be drawn from any field whatever—may not be even associately relevant, and yet the conclusion is sane and is later transferred entire to the situation and objects which originally determined the relational set. Two cases will be given, taken from a study of the drowsiness consciousness already reported.

(*a*) Observer played checkers nearly all day on ocean liner. "Retiring to the cabin before sleeping-time, I threw myself drowsily on my berth and fell to ruminating over some projected experiments on the comic, wondering whether to follow the order of merit method or a method of assigning numerical grade to each comic situation. I decide, but in my half-awake consciousness both the deliberation and the decision take the form of moves of checkers on the board. I decide to move my white man up to the king row and mentally watch C—— jump it with his black." The flow of imagery here was quite irrelevant, but the conclusion was valid and was transferred without modification to the situation which set up the thought process.

(*b*) "On board steamship, dressing for dinner in suit purchased abroad. Sitting drowsily on edge of berth and thinking that the suit had turned out to be a bad investment and had been forced upon me by a tricky salesman. Planning to buy cloth abroad this time to be made up in U. S., and wondering if it would pass customs. Thought over the conversation with the salesman and suddenly noticed that the rush of water, heard through the porthole, had become transformed into the voice of the salesman, trying to sell me the suit. Fall to musing in the process, wondering, while he talks, at his husky voice and why he has no more inflection."

In both these instances perfectly rational, sensible thought process was in progress, relations were felt and examined, and judgments passed. But the meanings were represented or sustained by utterly irrelevant sensory contents, which were in neither case simple images. In the first instance it was perseverative impressions of the men on the checker board, in the second the immediate auditory sensations that constituted the substantive points between which transitions were made and relations felt to exist.

These three chief stages seem to be only degrees of a common process, the principal characteristics of which are as follows:

1. There is a forward movement of relational consciousness—comparisons are made, positions, attitudes, bearings, consequences—in fact all manner of relations are handled, relations which exist between the genuine objects of experience.

2. These objects are not relevantly represented by imagery contents. At least in so far as the perception of relation goes they are not represented as the poles. They may, however, have been present at the very beginning to initiate the process and give it a determining direction.

3. Their place is taken by any content, revived, perseverative, or immediately sensory in character, which happens to be easily available at the time. These processes, by a sort of substitutional rôle, come to represent and impersonate the objects between which the relations, as socially recognized, would be said to hold. They carry out the thought, become the vehicle of influences, forces, and significances which they do not intrinsically possess.

4. Conclusions reached in terms of these vicariously functioning processes are transferred directly to the actual objects or experiences which originally set up the thought process and which may have been in consciousness in some sensory or revived form when the forward movement began.

5. A fair conclusion would be that the feelings of relation, depending, as they perhaps do, on centers associational in their func-

tion, are not quite naked processes—that association centers can function only in an active associational way, between two end processes, but that the precise character of these end processes and the cortical location of their corresponding areas is immaterial so long as the goal of the process, its tendency or direction, has once been set.

Just as in logic a relation presupposes substantives which are related, so in psychology the consciousness of relation implies the presence of sense content of some kind or other. Association areas, the activity of which may underlie the feeling of relation, do not initiate their own activity. Just as a relation involves related things, so association tracts function only as connecting lines between sensory or sensory and motor centers. The curious thing, however, is that any pair of sensory centers will suffice, no matter how irrelevant or derived they may be. The feeling of relation, or the relation itself, may well be the focal fact. This irrelevance of the sensory contents of the relational consciousness is what gives them their elusive character in introspection. The sensory material serves merely as the vehicle, the instrument of the process, and any vehicle will do. And the work of any one content may be taken up at any time by any other process which is available, yet the general forward movement be continuous. In the experience of the writer, present kinesthetic impressions or motor tendencies logically irrelevant are most frequently the vehicle or garment which plays the substantive rôle in relational consciousness.

Revived processes of almost any sort whatever, or even present incoming impressions, may vicariously function as standard-bearers for any intellectual exploration that may be in progress at the time. Thought may then never be really imageless, nor will it necessarily move in terms of a rigid photographic sensationalism. Thought must have garments, it is true, but it need not rely on its own providence. It is amply served by the charity of the passing moment,—by the vicarious functioning of irrelevant sense content. The validity of such thoughts seems to depend solely on the appropriateness of the association centers involved in the original set or disposition.

Such a conception is clearly incompatible with a schematic description of the functions of the cortical centers. The idea of a mapped out arrangement of sensory and motor centers with just as rigidly defined interconnections will not adequately represent the real functioning of the cortex. Such evidence as that just given argues for a much looser notion of free interplay of connection and pattern.

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REVIEWS AND ABSTRACTS OF LITERATURE

Die logischen Grundlagen der exakten Wissenschaften. PAUL NATORP. Leipzig: B. G. Teubner. 1910. Pp. xx + 416.

In the relation between philosophy and science periods of intimate *rapprochements* seem to alternate with periods of mutual distrust. Professor Natorp suggests that the true interrelations between the two are lost sight of in periods in which each is developing along established lines, but come to light in those critical periods in which either is compelled to strike out into new lines. At any rate, it is well to note that the traditional distrust of metaphysics on the part of scientists has recently been rapidly disappearing. The radical reconstruction of physical theory necessitated by recent research has driven physicists into philosophy almost in spite of themselves. As a token of this trend of the times, the firm of Teubner is now publishing a series of books under the heading "Science and Hypothesis," the contributors to which are such distinguished scientists as Poincaré, Planck, Enriques, and Picard.

It is a pleasure to welcome, in behalf of American readers, this excellent series, well printed, moderately priced, and gotten up in the handy form for which Teubner is justly famous.

The volume before us is the twelfth in the series, and represents the effort of a certain school of philosophy to reinterpret the meaning of mathematics and mechanics. The orthodox neo-Kantian movement, of which Herman Cohen is the Nestor, has always interpreted the Kantian metaphysics as the logical foundation of Newton's "Principia"; and of late the Marburg School, of which Cohen and Natorp are the leaders, and E. Cassirer in some respects a most brilliant ally, has been especially active in tracing in detail the logical structure of the mathematical and physical sciences. Professor Natorp has for the past twelve years been publishing a series of papers and booklets on the philosophy of mathematics, and the work before us is the definitive form of this neo-Kantian philosophy of the exact sciences. In consonance with its aim to be a modern "Critique of Pure Reason," the book seeks to be constructive throughout and *streng wissenschaftlich* in the classic sense. Still, the author does not disdain, in passing, to show us the frailties of the neo-Leibnitzians who have recently been hammering at the Kantian philosophy of mathematics in the most merciless manner. We may, therefore, also regard the book as the neo-Kantian counterblast to Russell's "Principles of Mathematics" or to Couturat's version of it.

Chapter I. is devoted to the consideration of "The Problem of a Logic of the Exact Sciences." As Professor Natorp views it, the situation resembles very much the one that confronted Kant. On one side are the empiricists, represented by Kronecker and Helmholtz, and on the other hand the neo-Leibnitzian school of Frege, Russell, etc., who would reduce mathematics to pure logic. Professor Natorp, like Kant, rejects both of these positions, holding fast both to the *a priori* and the synthetic char-

acter of mathematical knowledge. He does not, however, follow Kant in attributing the peculiar certainty of mathematics to an *a priori* intuition. Instead he bases it on the synthetic process of thought. This, of course, will appear to many as an abandonment of the distinctively Kantian attitude, and as opening the floodgates of Hegelian panlogism which was so foreign to Kant. Professor Natorp, however, while a professed and thoroughgoing idealist, is tenacious in his adherence to the transcendental method and to the distinction between analytic and synthetic thought.

Dismissing the empiricists as not even worthy of the courtesy of a refutation, our author introduces his own point of view through a criticism of the analytic or "formalist" school. The error of this view is traced to the "dogmatic" Aristotelian logic which proposes to define everything until we come to the indefinable and prove everything until we get to the undemonstrable. This in turn is based on the fundamental error of naïve realism which regards things as given in perception, and conceives the work of thought to consist in the analytic working over of the content of perception. In opposition Professor Natorp holds to the Kantian dictum: No analysis without previous synthesis. As we can not observe this synthesis in action, it is attributed to a "primitive understanding" (p. 9). About the metaphysic of this primitive understanding, where, when, and what it is, *e. g.*, whether it is an individual or universal mind, etc., no revelations are made to us. The only thing the author is willing to tell us is that it is not in time, and is beyond the ken of the psychologist (*cf.* p. 99). The uncertainty in which we are left as to the whereabouts of this primitive synthesis, prevents us from understanding Professor Natorp's attitude to ordinary logic. On one hand he tells us that ordinary logic is analytic and can not extend our knowledge. Like the microscope, it can widen the angle between the rays, but can not increase their number. On the other hand, he admits that Frege, Couturat, and even Wolff and the older Leibnitzians mean by analysis something which does extend our knowledge. Indeed he is forced to use his own example of the microscope and admit that that instrument can materially add to our knowledge.

The effort to find a starting-point for his logic gives our author—not to mention the reader—considerable trouble. The transcendental method consists in following presuppositions. But there are no presuppositions unless something is given. What *is* given? It can not be the object of perception, for that is precisely the thing which it is the aim of knowledge to determine. After a long discussion, in which a great deal of emphasis is laid on infinite process, *genetisch* as opposed to *ontisch*, the *fieri* as opposed to the *factum*, we reach the conclusion that the problem of logic (*i. e.*, the transcendental variety) is to find those presuppositions which are necessary to bring the x—the undetermined, but to-be-determined, object of experience—into complete determination. This complete determination, we are assured almost *ad infinitum*, can be reached only by an infinite process.

In the second chapter we have a modernized deduction of the categories.

The dry bones of the Kantian framework receive a great deal of flesh and blood. In the end, however, they turn out to be our old friends the Twelve, marching in four groups of three each. If it were not for the fact that students at our colleges *do not* read German, this chapter could profitably be recommended to those who are reading Kant for the first time and who generally can not grasp what these categories are about.

In the third chapter we have a deduction of the number concept and of the four rules of arithmetic. The first condition, we are told, for the understanding of number is not to have anything to do with given things, for the latter already presuppose number. We must deal with rules of thought. Thought consists in nothing but positing relations, and the terms between which the relations hold are subsequent to the positing activity. Thus there is built up a fundamental series from which the number series is deduced. The issue of priority between ordinal and cardinal numbers is settled by calling them correlative. The mooted question as to whether the idea of number is dependent on time and space is answered mainly in the negative. Professor Natorp, however, thinks he saves something of the Kantian position by insisting that the relation of *before and after* is the common basis of number as well as of time and space. In his analysis of the operations of arithmetic he follows Simon, without, however, fully subscribing to the latter's stark subjectivism. Natorp admits that it is not enough to call numbers mental objects. We must show how they help us to cognize objects.

The critical work in this chapter is, whatever one may think of the constructive part, decidedly unsatisfactory. There is no attempt to come to close quarters with Russell's or Whitehead's definitions of numbers or their operations. Frege is taken as typical of the whole school, and arguments are used against him which Russell specifically answers. Many readers, however, who can not grow enthusiastic about the application of transcendental logic in this field, will agree with Professor Natorp in his insistence that not only are the so-called real numbers (*i. e.*, surds) and fractions to be looked on as operations, but even the series of positive integers must be so considered.

Chapter IV. is devoted to "Continuity and Infinity" and Chapter V. to "Direction and Dimension" as terminations of pure number. The modern account of infinity and continuity is accepted, but Professor Natorp remains loyal to Herman Cohen and insists on the notion of the infinitesimal. By means of this he builds up the idea of the *reality of something* which forms a transition from mathematics to mechanics. The specific criticisms of Russell against Cohen's use of the infinitesimal method are not directly answered. Indeed, so far as the Marburg school is concerned, the great work of Weierstrass might as well never have been accomplished.

Chapter VI. is entitled: "Time and Space as Mathematical Structures (*Gebilde*)." In the discussion of time and space the author adheres, in the main, to the Kantian view. He would, however, change the Kantian order somewhat, and make time and space refer back to the categories of modality, relation, etc. The main point seems to be the insistence that

time and space are more than number in so far as they give existential reference to that which otherwise would be purely mathematical.

In the discussion of geometry, Professor Natorp no longer contends, as he did a few years ago, that metric geometry can not be subordinated to projective geometry; and he also seems to weaken somewhat in his hopeless stand that non-Euclidean geometry contradicts the fundamental axioms of the continuity and homogeneity of space. Logically, he reluctantly admits, non-Euclidean geometry is possible. He rejects it, however, on the philosophical ground that a space of more than three dimensions or of non-Euclidean constitution would lead to endless indeterminateness, and make existential reference impossible. Why a three-dimensional Riemannian space, or even a four-dimensional mechanics as recently sketched by Minkowski, should be considered any more indeterminate than Euclidean space or Newtonian mechanics, the present reviewer can not understand. A friend, however, makes the perhaps irrelevant suggestion that no man over forty-five will ever admit the possibility of a system of geometry other than the one which he was taught when a boy.

The last chapter—perhaps the most interesting—is entitled: "The Temporo-spatial Order of Phenomena and the Mathematical Principles of Natural Science." In the discussion of the question of absolute time and space, Mach's arguments against Newton are easily turned around to fortify the Kantian position. Absolute time and space are not found *in* experience precisely because they are the very conditions which make experience possible. Mach's argument that absolute time and space are not real things and, therefore, of no practical importance, is met by the observation that in the same way nothing in our experience is absolutely one, yet the laws of arithmetic based on abstract numbers are assuredly of some practical importance. Natorp's criticism of Mach would have been more effective if the former were in a position to analyze the latter's conception of existence (in the assertion that only relative motion *exists*); but Natorp's own conception of existence is, like that of most philosophers, entirely vague. For the most part he holds existence to be equivalent to complete determination (*cf.* pp. 336, 338). As we are repeatedly told that the process of determination is infinite, it would seem that the *existence* of things is the one thing forever unattainable to us.

The remainder of the last chapter is devoted to an epistemologic deduction of the fundamental laws of mechanics. Newton's laws of motion, and even the principle of the conservation of energy, are all shown to be necessary on the principles of transcendental logic. It is not likely, however, that Messrs. Abraham, Lewis, Bucherer, and the others will take those proofs so seriously as to discontinue their labors in the direction of a non-Newtonian mechanics which should meet the facts of physics more adequately than does the classic mechanics.

In the last two paragraphs of the book we have one of the first attempts to determine the philosophic value of the relativity theory of Einstein and Minkowski. There is, however, no attempt to discuss the point wherein this theory does most violence to traditional views, viz., its conception of what constitutes simultaneity.

The book before us is German in more senses than one. It is thorough and packed with information and close reasoning. The author has spent considerable labor on the great mathematicians—though one suspects that the intercourse has been too Platonic, *i. e.*, chaste and unfruitful. Professor Natorp does not seem to know the English or Italian works on symbolic logic. He apparently has not read Russell's book on Leibnitz; indeed, he has not read Russell's "Principles of Mathematics" with great care, if we are to judge by his references to Russell's views on analytic and synthetic judgments. There is also no reference to such French works on the theory of science as those of Picard or Duhem. There are, indeed, a few references to the German translation of Poincaré's "Science and Hypothesis," but the fundamental thesis of that work is not dealt with. Indeed, from the point of view which looks upon the fundamental principles of mathematics as hypotheses justified only by the fact that they give us a coherent scientific system, a good deal of Natorp's work as to the foundation of these principles must appear as entirely uncalled for.

Two closely related methods are typified in this book, which are characteristic of classic Hegelian philosophy and which have caused the latter to fall into such sad repute. These are (1) the method of dealing with the implication of *concepts* (not to be confused with the implication of propositions), and (2) the covert appeal to the self-evident. These methods are due to the prevailing belief that the relation between any two ideas is a relatively simple affair, which does not, like the relation between natural objects, need elaborate investigation. It is one of the great services rendered by mathematics to have shown that the relation between ideas requires long and patient inquiry, in which we are to be especially on our guard against any appeal to the apparently obvious. In a question like the convergency of a series, that which most people would regard as obvious turns out after laborious investigation to be almost invariably wrong.

We must, however, agree with Professor Natorp that there is much less danger to-day of Hegelian intrusions into the special sciences than there is of ignoring the fundamental problems of philosophy and of substituting for them an easy mixture of propositions from biology or physics seasoned with logically loose and vague general reflections. Such seem to me Ostwald's "Naturphilosophie," and, in large measure, a good deal of the work of Avenarius and Bergson.

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VIme congrès international de psychologie: rapports et comptes rendus. ED. CLAPARÈDE (Editor). Geneva: Kündig. 1910. Pp. 877.

It is impossible to attempt, in a short review, a summary of the substance of the various papers and discussions given at this congress, held in 1909, and reported in the foregoing large-paged, bulky volume. It may be of interest, however, to indicate the matters that the directing committee deemed at that time chiefly important for discussion, by listing the topics, with the number of pages in the report devoted to each. (1) "The

Subconscious" (pp. 69): papers by Dessoir, Janet and Prince, aiming chiefly at a definition of the term. (2) "Religious Psychology" (pp. 77): papers by Höffding and Leuba. (3) "Psychology of the 'Sentiments'" (pp. 44): a paper by Külpe on the definition and characteristics of feeling, the methods of investigation and results and theories, and one by Sollier on "Le sentiment Cénesthésique." (4) "Perception of Position" (pp. 20): paper by Bourdon on the position of the body and its various members in relation to the vertical. (5) "'Mediumistic' Phenomena" (pp. 16): a paper by Alrutz on experiments in "levitation." (6) "Distance Orientation" (pp. 18): paper by Thauziés—historical, critical, and experimental—on the distance orientation of the carrier pigeon. A theory involving a magnetic sense is supported. (7) "The Tropisms" (pp. 78): papers by J. Loeb, Jennings, and Bohn setting forth their views on the nature of tropisms. (8) "Classification of Backward Pupils" (pp. 84): papers by Decroly, Heller, Ferrari, and Persigout. (9) "Pedagogical Psychology" (methodology) (pp. 32): paper by Ioteyko.

The discussions on the papers showed much lack of unanimity, even as to definition and the admissible psychological presuppositions, especially concerning the first three topics and the "tropisms."

Following the report of these set topics, the discussion concerning uniformity in psychological terminology, color standardization and classification, and in mathematical treatment of results is given. The practical upshot of this was the appointment of an international committee on terminology and the passing of a resolution to the effect that any one coining a new psychological term should so construct it that it might be embodied alike in all languages, or with only unavoidable modifications to suit the genius of a particular tongue.

Then follow 232 pages of unclassified individual communications.

ROSWELL P. ANGIER.

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JOURNALS AND NEW BOOKS

REVUE DE PHILOSOPHIE. June, 1911. *Le tempérament nerveux* (pp. 561–582): J. TOULEMONDE. – The nervous adult, differing radically from the nervous child, is essentially characterized by the lack of self-confidence, a lack which gives rise to imaginary ills and numberless other consequences of autosuggestion. This defect may be removed by means of proper education. *L'évolution actuelle du socialisme française* (second article) (pp. 583–607): L. GARRIGUET. – Syndicalism, a new and vital form of revolutionary socialism, aims to free the laborer from all control of superiors and to substitute therefor the voluntary discipline of workers who form an association but not a hierarchy. Its goal is a method of production perfect from the laborer's point of view. *A propos de quelques imperfections de la connaissance humaine* (second article) (pp. 608–620): M. GOSSARD. – In the nature of things our concepts of essence and of first cause are of necessity incomplete and inadequate. *La loi naturelle*

(pp. 621–636): E. BRUNETEAU. – The immutable and universal natural law of morals consists essentially in that a man should live as a man, not as an animal or as a spirit. *Analyses et comptes rendus.* B. Russell, *Philosophical Essays;* F. C. S. Schiller, *Riddles of the Spinx;* M. Neeser, *La religion hors des limites de la raison:* J. GARDAIR. L. Cuénot, *La genèse des espèces animales:* F. CHOVET. J. Segond, *Cournot et la psychologie vitaliste:* F. MEUTRÉ. A Tornezy, *La légende des philosophes:* T. DE VISAN. B. Telesio, *De rerum natura. Recension des revues et chronique.*

Harris, I. The Significance of Existence. London: Longmans, Green, and Co. 1911. Pp. 324. 6s.

Royce, Josiah. William James and Other Essays on the Philosophy of Life. New York: The Macmillan Company. 1911. Pp. xi + 301. $1.50.

Scott, Walter Dill. Increasing Human Efficiency in Business: A Contribution to the Psychology of Business. New York: The Macmillan Company. 1911. Pp. v + 339. $1.25.

NOTES AND NEWS

THE eleventh annual meeting of the American Philosophical Association will be held at Harvard University, Cambridge, December 27 and 29, under the presidency of Professor Woodbridge. The headquarters of the Association will be at the Harvard Union. The leading subject for discussion will be "The Relation of Consciousness and Object in Sense Perception." The committee on definitions has prepared definitions of terms pertaining to this subject to which participants in the debate will be expected to adhere. The discussion will be led by Professors Thilly, Lovejoy, Miller, and Montague. In addition to the main subject, the following topics will be discussed: (1) "The Nature of Cause and the Place of Conception in Metaphysics." (2) "What, precisely, are we to understand by the term Evolution?" (3) "The Nature of Logic. Does the study of the subject deal with thought processes, or with quite non-mental terms and relations?" (4) "Do persistent illusions presuppose consciousness? If so, what consequences follow?" An extended announcement of the meeting, embodying the report of the committee on definitions, may be had by applying to the secretary of the Association, Professor E. G. Spaulding, Princeton University, Princeton, N. J.

THE twentieth annual meeting of the American Psychological Association will be held in Washington on Wednesday, Thursday, and Friday, December 27, 28, and 29, under the presidency of Professor Seashore. Hotel headquarters will be at the Ebbitt House. A symposium on the demarkation of the distinct difference between "Instinct and Intelligence" will be opened by Dr. Marshall. Professor Herrick, Professor Yerkes, and Professor Judd have already completed the preparation of their contributions to this symposium. Papers on the experimental study of animal

behavior will be read before a joint session with Section F of the American Association for the Advancement of Science, and the society will unite with section L for one session devoted to reports on research in educational psychology. The committee on experiments useful in teaching psychology (class and home experiments) will have some definite results of their year's work to present to the Association. Plans are brewing for a program on psychology in its relations to medical education. The proposal meets with the hearty approval of such representative educators as Drs. Adolf Meyer, Donaldson, and Prince. An exhibit of apparatus is being arranged.—*Science.*

THE National Association for the Study and Education of Exceptional Children held its second annual conference on the problem of the exceptional child on Friday and Saturday, December first and second. The day sessions were held in the auditorium of the School of Pedagogy of New York University, Washington Square; and there was an evening session on Friday in the building of the Society for Ethical Culture, Central Park West, New York City. A number of educators, physicians, and social workers participated in the proceedings and read papers. The topics discussed were as follows: "Causes of Exceptional Development in Children," "Educational Needs of the Various Kinds of Exceptional Children," and "The Exceptional Child as a Social Problem."

THE New York Branch of the American Psychological Association met in conjunction with the Section of Anthropology and Psychology of the New York Academy of Sciences on November 27. An afternoon session was held at the psychological laboratory of Columbia University and an evening session at the American Museum of Natural History. Between these two sessions an informal dinner was held at the Faculty Club of Columbia University.

A COMMITTEE consisting of Professors Baumgartner, of Breslau, and Wittmann, of Eichstätt, has been formed to celebrate, on September 13, 1913, the sixtieth anniversary of M. Clément Baeumker, professor of philosophy in the University of Strasburg and editor of "Beiträge zur Geschichte der Philosophie des Mittelalters."—*Revue des sciences philosophiques et théologiques.*

DURING the past month Dr. Günther Jacoby, Privatdocent in the University of Greifswald, delivered three lectures in philosophy at Columbia University. The subjects of the several lectures were: "A German Pragmatist," "Pragmatism, Bergson, and Schopenhauer," and "Current Thought in Germany."

THE Columbia University Press will bring out shortly the series of eight lectures on "The Genius of the Common Law" delivered this autumn at Columbia University by Sir Frederick Pollock.

A MEETING of the National Academy of Sciences was held in New York City on November 21 and 22.

THE MACMILLAN COMPANY will bring out shortly "A Critical Exposition of Bergson's Philosophy," by J. M'Kellar Stewart.